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A SURVEY OF AIR POLLUTION EFFECTS IN MISSISSIPPI

by

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INTRODUCTION

During the week of July 15, 1974, a detection survey for air pollution effects was conducted in portions of five Mississippi counties. The survey was a cooperative effort between the Mississippi Forestry Commission and the U. S. Forest Service. Its purpose was to identify forest areas which may have been affected by air pollution and to determine which of these areas require further evaluation.

METHODS

The survey included most of the areas in the State with major sulfur dioxide sources, and some additional areas where possible air pollution effects had been reported. Selection of areas was based primarily on data provided by the Mississippi Division of Air Pollution. Areas selected were in five counties: Clarke, Harrison, Jackson, Jones and Lamar.

The extent of the survey in each area varied with stack height and availability of roads. Where stacks extended well above the surrounding forest canopy, roads within a three to four mile radius were covered. In other areas, coverage was usually less. In some areas, a scarcity of roads limited coverage.

Observations were recorded at a minimum of three data points in each area. Data points were selected along or near roads at locations where several forest species could be examined. Loblolly pine trees under six feet in height were used as the principal indicator. Some of the other species frequently examined included blackberry, winged sumac, and lesser ragweed. On loblolly and other pines, the most

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recent set of needles was checked for tip necrosis or banding. Broadleaved species were examined for interveinal or marginal, bifacial necrosis. These are symptoms that have been associated with injury by sulfur dioxide and certain other air pollutants. The possibility that agents other than air pollutants can cause the same symptoms was considered. The percentage of individuals in each species with the above symptoms was estimated and recorded as: 0 = none; 1 = <6%; 2 = 6-20%; 3 = 21-50%; 4 = 51-100%. In addition, the mean percentage of leaves affected on the individuals examined in each species was estimated and recorded as: 1 = <6%; 2 = 6-20%; 3 = 21-50%; 4 = 51-100%.

RESULTS

Five areas were selected for the survey. A summary of information recorded in each area follows:

Survey Area No.: One
County: Clarke
Source: Gas Processing Plant - Pumping Station
Location: T10N, R8W, S5, N½
Pollutants: Hydrogen sulfide, sulfur dioxide and possibly others
History: Possible effects first observed about two years ago
No. Data Points Taken: 3
Location of Data Points: All data points were in T10N, R8W, S5, N½. Their approximate location in relation to the source was as follows: one - 0.3 mile northeast; two - 0.4 mile northwest; three - <0.1 mile north.
Field Observations: Foliar symptoms were recorded on several species (Table 1).
Based on roadside observations, needle-tip necrosis on loblolly pine (Fig.1) appeared to be localized mainly in Section 5. Slight needle-tip necrosis was observed in one portion of a 2-year-old loblolly pine plantation near the east boundary of Section 5, possibly in Section 4.
Effects of recent forest fires were observed northwest of the source in Section 5, and north of the source in either Section 5 or 36.

Survey Area No.: Two
County: Harrison
Source: Several sources are in same vicinity. The largest is an electric generating station.

Table 1.--Occurrence of foliar symptoms by data point and species, survey area number one, Clarke County, Mississippi, July 1974

Species	DATA POINTS					
	ONE		TWO		THREE	
	Individuals affected[1/]	Leaves affected[2/]	Individuals affected	Leaves affected	Individuals affected	Leaves affected
Loblolly pine <6 ft.	4	1	4	4	4	4
Loblolly pine >6 ft.	4	1	-	-	4	4
Shortleaf pine <6 ft.	4	3	4	4	4	4
Shortleaf pine >6 ft.	4	1	3	3	4	4
Blackjack oak	-	-	4	4	4	4
Southern red oak	-	-	-	-	4	2
Sweetgum	-	-	4	2	4	2
Blackberry	4	3	2	1	4	3
Winged sumac	4	1	4	3	4	2
Lesser ragweed	2	1	4	2	-	-

[1/] Estimated percentage of individuals with foliar symptoms (needle banding or tip necrosis; interveinal or marginal necrosis): 0 = none; 1 = <6%; 2 = 6-20%; 3 = 21-50%; 4 = 51-100%; - indicates species either not present or not rated.

[2/] Estimated mean percentage of leaves affected on individuals of the species: 1 = <5%; 2 = 6-20%; 3 = 21-50%; 4 = 51-100%.

Figure 1. Example of foliar symptoms observed on loblolly pine in survey area No. 1, Clarke County, Mississippi, July 1974.

Location: The electric generation facility is located in T7S, R10W, S18. A chemical plant is located in Section 19 of the same township. The locations and types of other sources in the area were not recorded.
Pollutant: Sulfur dioxide and possibly others.
History: Loblolly pine decline and mortality were reported about two years ago, principally in T7S, R10W, S19 and 30. The cause of the problem has not been determined. The results of our work to determine the cause will be the subject of a later report.
No. Data Points taken: 14
Location of Data Points: One - T7S, R10W, S8; two - T7S, R10W, S30; three - T7S, R10W, S30; four - T7S, R10W, S29; five - T7S, R11W, S23; six - T7S, R11W, S10; seven - T7S, R11W, S2; eight - T6S, R11W, S25; nine - T6S, R10W, S32; ten - T7S, R10W, S17; eleven - T7S, R10W, S19; twelve - T7S, R10W, S19; thirteen - T7S, R10W, S19; fourteen - T7S, R10W, S16.
Field Observations: The following species were examined at one or more data points: loblolly pine $<$ 6ft., loblolly pine $>$ 6 ft., longleaf pine $>$ 6 ft., slash pine $<$ 6 ft., slash pine $>$ 6 ft., water oak, post oak, hickory, pecan, sweetgum, redbud, dogwood, blackberry, winged sumac, lesser ragweed, morning-glory, wild grape, poison ivy, willow $<$ 6 ft., honeysuckle, pear, peach.

At data point four, needle-tip necrosis was observed on about 20 loblolly pine $>$ 6 ft. At the same data point marginal and interveinal necrosis were observed on wild grape (Fig. 2) and water oak. The affected plants were located along a drainage ditch which receives runoff from around an electric transmission facility. Injured plants were observed along the drainage ditch above the area of affected trees and around the margin of the facility, indicating that the injury may have been caused by a herbicide.

The loblolly pine decline and mortality first reported two years ago in Section 19 was observed during the present survey at data points 11, 12, and 13. The observations made at these data points will be included in a later report.

Survey Area No. : Three
County: Jackson
Source: Several, including a petroleum refinery and some chemical plants.
Location: T8S, R5W, S16, 17, 20, 21.
Pollutant(s): Sulfur dioxide, fluoride and possibly others.
History: No information available.

Figure 2. Foliar symptoms on wild grape possibly caused by a herbicide, survey area No. 2, Harrison County, Mississippi, July 1974.

No. Data Points Taken: 4
Location of Data Points: One - T8S, R5W, S9, SW¼; two - T8S, R5W, S8, SW¼; three - T8S, R5W, S5, NE¼; four - T7S, R5W, S28, SE¼.
Field Observations: No symptoms similar to those caused by sulfur dioxide, fluoride, or other air pollutants were observed. The following species were examined at one or more data points: slash pine < 6 ft., slash pine > 6 ft., water oak, sweetgum, willow, red maple, waxmyrtle, blackberry, winged sumac, lesser ragweed, wild grape, greenbrier, elderberry.

Survey Area No.: Four
County: Jones
Source: Electric Generating Station
Location: T7N, R13W, S33
Pollutant: Sulfur dioxide
History: No information available
No. Data Points Taken: 4
Location of Data Points: One - NW¼ of S33 about 0.3 mile northwest of source; two - NE¼ of S28 about 1.5 miles north of source; three - NW¼ of S34 about 0.5 mile northeast of source; four - NE¼ of S4 about 0.5 mile south of source.
Field Observations: No symptoms similar to those caused by sulfur dioxide were observed. The following species were examined at one or more data points: Loblolly pine < 6 ft., loblolly pine > 6 ft., green ash, yellow-poplar, sweetbay, American beech, sweetgum, blackberry, winged sumac, lesser ragweed, wild grape, greenbrier, wild sunflower. A stand of trees apparently injured by flooding was observed in the NE¼ of S28.

Survey Area No.: Five
County: Lamar
Source: Two sources, one a petroleum refinery and the other a coke calcinating plant.
Location: Petroleum refinery is in T13N, R14W, S28. The other source is in Section 34 of the same township.
Pollutants: Sulfur dioxide and possibly others.
History: Petroleum refinery has been in operation for several years.
No. Data Points Taken: 2
Location of Data Points: One - T12N, R14W, S4, NE¼ about 1.5 miles south of petroleum refinery and 1.5 miles southwest of the other source; two - T13N, R14W, near south boundary of Section 28 about 0.2 mile southwest of petroleum refinery and 1.2 miles west of the other source.
Field Observations: Foliar symptoms were observed on several species at data point two (Table 2, Figure 3).
Based on roadside observations, needle-tip necrosis on loblolly pine appeared to be localized extending from data point 2 about 0.5 - 0.6 mile north into Section 28.

Table 2.--Occurrence of foliar symptoms by data point and species, survey area no. five, Lamar County, Mississippi, July 1974

Species	DATA POINTS			
	ONE		TWO	
	Individuals affected	Leaves affected	Individuals affected	Leaves affected
Loblolly pine >6 ft.	-	-	4	4
Longleaf pine <6 ft.	0	0	-	-
Longleaf pine >6 ft.	0	0	3	3
Water oak	0	0	3	2
Southern red oak	0	0	-	-
Willow oak	-	-	0	0
Post oak <6 ft.	-	-	1	4
Post oak >6 ft.	-	-	0	0
Hickory <6 ft.	-	-	4	2
Hickory >6 ft.	-	-	0	0
Dogwood	0	0	-	-
Sassafras	0	0	-	-
Wisteria	0	0	-	-
Blackberry	0	0	-	-
Greenbrier	-	-	0	0

Figure 3. Example of foliar symptoms observed on oak, survey area No. 5, Lamar County, Mississippi, July 1974.

DICUSSION AND RECOMMENDATIONS

Of the areas surveyed, probably only area 1 should be considered for further evaluation. Most, if not all, of the affected trees examined this year in area 1 will probably recover. The purpose of an evaluation would be to determine whether the problem is increasing or decreasing, and to measure any effect on tree survival. Several plots would need to be established in and adjacent to the affected area. These would be examined at least three times during each growing season, for an indefinite number of years.

The possibilities that other sources similar to that in area 1 may be present elsewhere in the State should be considered. If any similar sources are located, they should be surveyed.

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